

WHAT IS CLAIMED IS:

1. A method for forming an ultra hard layer, comprising:  
providing a refractory metal enclosure having an inner wall;  
disposing a metallic liner within said enclosure;  
5 placing ultra hard material feed stock within said enclosure; and  
sintering to convert said ultra hard material feed stock to a solid ultra hard material layer.
2. The method as in claim 1, wherein said refractory metal enclosure is formed of at least one of Nb, Mo, Ta, and other members of the IVB, VB and VIB  
10 families of the periodic table.
3. The method as in claim 1, wherein said metallic liner is formed of at least one of Fe, Co, and Ni.
4. The method as in claim 1, wherein said placing comprises sandwiching the metallic liner between the ultra hard material feed stock and the enclosure.
- 15 5. The method as in claim 1, wherein said inner wall comprises a peripheral wall and disposing a metallic liner comprises disposing a metallic liner adjacent said peripheral wall.
6. The method as in claim 1, further comprising disposing a substrate material within said enclosure such that said sintering bonds said substrate to said  
20 ultra hard material layer.
7. The method as in claim 6 during sintering the liner and at least a compound of the ultra hard material feed stock form a eutectic having a melting temperature lower than a melting temperature of a eutectic of the substrate material.
8. The method as in claim 6 during sintering the liner and at least a  
25 compound of the ultra hard material feed stock and the enclosure form a eutectic

having a melting temperature about the same as that of a eutectic the substrate material .

9. The method as in claim 6 during sintering the liner and at least a compound of the ultra hard material feed stock and the enclosure form a eutectic  
5 having a melting temperature in the range of about 1100°C to about 1410°C

10. The method as in claim 1, wherein said disposing ultra hard material feed stock comprises disposing diamond feed stock material within said enclosure.

11. The method as in claim 1, wherein said disposing ultra hard material feed stock comprises disposing cubic boron nitride feed stock material within said  
10 enclosure.

12. The method as in claim 1, wherein said metallic liner has a thickness within the range of 0.005mm to 3mm.

13. The method as in claim 1, wherein said solid ultra hard layer includes a peripheral edge, said metallic liner includes a metallic material and said sintering  
15 causes said metallic material to infiltrate a portion of said ultra hard layer extending no further than 500 microns inward from said peripheral edge.

14. The method as in claim 1, wherein said sintering produces said ultra hard material layer to be substantially free of fractures, chips and cracks.

15. The method as in claim 1 during sintering the liner and at least a compound of the ultra hard material feed stock and the enclosure form a eutectic  
20 having a melting temperature in the range of about 1100°C to about 1410°C.

16. The method as in claim 1, further comprising joining said ultra hard layer to a substrate to form a cutting element, and mounting said cutting element on a bit body.

17. The method as in claim 1, wherein said disposing a metallic liner within said enclosure comprises providing a strip of said metallic liner having opposed ends and spot welding said opposed ends to each other to produce a cylindrical shape.

5 18. The method as in claim 1, wherein the liner is in the form selected from the group of forms consisting of foils, rings, tubes, pastes, coatings, sputterings, and slurries.

19. The method as in claim 1, wherein the liner forms a continuous peripheral layer around the entire periphery of the enclosure.

10 20. The method as in claim 1, wherein disposing comprises disposing a metallic liner having a melting temperature lower than the melting temperature of the enclosure.

15 21. A method for forming an ultra hard layer, comprising:  
providing a refractory metal enclosure having an inner wall;  
disposing a liner within said enclosure;  
placing ultra hard material feed stock within said enclosure ;  
placing a substrate material within said enclosure over the feed stock; and  
sintering to convert said ultra hard material feed stock to a solid ultra hard  
layer, wherein a melting temperature of a eutectic formed during sintering between  
20 the liner, a compound of the ultra hard material, and the enclosure is in the range of about 1100°C to about 1410°C.

22. The method as in claim 21 wherein during sintering, the liner and at least a compound of the ultra hard material feed stock form a eutectic having a melting temperature about the same as that of a eutectic of the substrate material.

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23. A method for forming an ultra hard layer, comprising:  
providing a refractory metal enclosure having an inner wall;

disposing a liner within said enclosure, the liner having a melting temperature lower than the enclosure;

placing ultra hard material feed stock within said enclosure; and

5 sintering to convert said ultra hard material feed stock to a solid ultra hard layer.

24. The method as in claim 23 further comprising placing a substrate material within the enclosure, wherein during sintering, the liner, the enclosure and a compound of the ultra hard material feed stock form a eutectic having a melting temperature lower than a melting temperature of a eutectic of the substrate material.

10 25. The method as in claim 23 further comprising placing a substrate material within the enclosure, wherein during sintering, the liner, the enclosure and a compound of the ultra hard material feed stock form a eutectic having a melting temperature about the same as that of a eutectic of the substrate material.

15 26. The method as in claim 23 wherein during sintering, the liner, the enclosure and a compound of the ultra hard material feed stock form a eutectic having a melting temperature in the range of about 1100°C to about 1410°C